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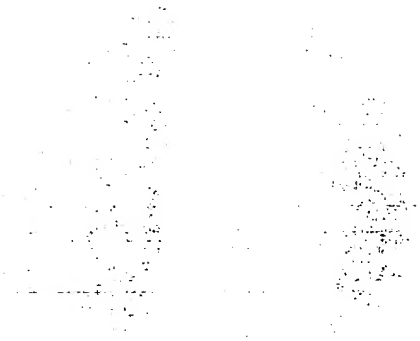
Signed

Dated 2000



Patents Form 1/77

Patents Act 1977
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04MAR99 E430016-1 D02838
P01/7700 0.00 - 9904925.6

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

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A
4 MAR 1999
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The Patent Office

Cardiff Road
Newport
Gwent NP9 1RH

1. Your reference SCE/NS/STS 29

2. Patent applic *(The Patent Of)* 9904925.6 4 MAR 1999

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Surface Technology Systems Limited
Imperial Park
Newport
Gwent
NP1 9UJ

Patents ADP number *(if you know it)*

If the applicant is a corporate body, give the country/state of its incorporation United Kingdom 05534151002

4. Title of the invention

Gas Delivery System

5. Name of your agent *(If you have one)*

Wynne-Jones, Laine & James

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

22 Rodney Road
Cheltenham
Gloucestershire GL50 1JJ

Patents ADP number *(if you know it)* 1792001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

Yes

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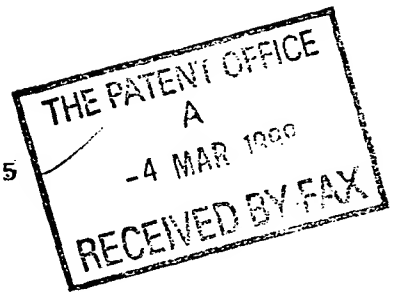

Continuation sheets of this form	
Description	5
Claim(s)	
Abstract	
Drawing(s)	

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application.

Signature Wynne-Jones, Lainé & James Date 4th March 1999

12. Name and daytime telephone number of person to contact in the United Kingdom Mr. S.C. Eastwood (01242) 515807

Warning

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Notes

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d) If you have answered 'Yes' Patents Form 7/77 will need to be filed.

e) Once you have filled in the form you must remember to sign and date it.

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Gas Delivery System

This invention relates to a gas delivery system, particularly, although not exclusively, one for use in a plasma processing apparatus, for example one in which a switched etch/deposition cycle or continuous process is used on a semiconductor wafer or the like.

Dry process continuous and switched etch/deposition processes uses sulphur hexafluoride as the standard etch chemistry. The industry demands for higher etch rate processes have led to the investigation of alternative process etch gases which allow an increase in the density of active species in the process chamber resulting in improved process rates.

Several different chemistries are known to be likely candidates to enhance the process rate. All suffer from increased cost, greater health and safety risks and poor commercial availability. These factors combine to make the economics of implementing these chemistries extreme and/or the installation too hazardous. Latterly, a number of molten electrolyte gas generators have been reported and are just being made commercially available. These gas generators include fluorine, nitrogen trifluoride and chlorotrifluoride. They are able to generate the process gases to high purity and at a reasonable cost and risk. The gas generators contain a solid when cold and this allows for safe transportation and storage of the units.

The incorporation of these gas generators into a gas delivery system local to the process chamber allows a novel capability to introduce different processes gases into a variety of process schedules to achieve a process advantage. There are many novel aspects to the application of these gas generators to a dry processing environment in terms of system design, gas delivery control, system transportation, ease of installation and process advantages.

Thus, according to a first aspect of the present invention there is provided an apparatus for treating a substrate, the apparatus comprising a chamber, a support for a substrate and delivery system for delivering an etching and/or deposition gas into the chamber, wherein the delivery system is positioned locally to the chamber.

"Locally" means that the delivery system is associated with a particular apparatus rather than being a central supply for a number of apparatuses.

According to a second aspect of the present invention, there is provided a method of treating a substrate comprising providing an etch and/or deposition gas to a chamber in which the substrate is situated, wherein the gas is delivered from a delivery system positioned locally to the chamber.

According to a third aspect of the present invention, there is provided a method of treating a substrate comprising cyclically performing the following steps:

a) etching the substrate with a gas;

b) depositing a passivation layer on the surface of an

etched feature; and

c) selectively removing the passivation layer from the etched feature,

wherein the etching gas comprises fluorine, nitrogen trifluoride or chlorotrifluoride or mixtures thereof.

Indeed, the gases can be mixed with SF_6 or other known gases.

Safety issues compared to the conventional cylinder delivery:

1. The generators operate at atmospheric pressure eliminating the need for high pressure regulators on the system.

2. There is no potentially hazardous gas in the system until the user demands production eliminating hazardous storage problems. The risks to operators are significantly reduced.

3. At room temperature the gas generators have a solid constitution eliminating the risks of transporting the hazardous gas on site or to the working location.

4. The local delivery on demand eliminates long gas lines from a central store on the installation and the associated risks of hazardous gases in these pipes.

Reduced cost of installation of the gas generators compared to conventional cylinder delivery.

1. The local delivery system eliminates the expense to add additional long gas lines from a central store on the installation to the processing environment.

2. The production of the process gas from the generator is typically comparable to the high pressure cylinders.

3. The close proximity to the process equipment minimises the safety precautions needed to protect the operator during any maintenance operations.

Features of this novel use of the gas generators may be:

1. A totally dry method of heating the electrolyte instead of the normal hot water bath.

2. The gas generators produce a gas at both the anode and the cathode of the electrolytic cell. The two gases are potentially extremely reactive but are separated by the design of the system to avoid any possible recombination.

3. The gas generators are only designed to be operated at atmospheric pressure. The design of the gas line to the process chamber incorporates a novel control system such that the generator does not see the low pressure (vacuum) at the process chamber. This is an important design feature of the gas generators operation on the overall system.

4. Included in the local delivery system is the ability to polish the generated gas to remove unwanted impurities before passing into the process chamber.

It is envisaged that the invention can be used in our following co-pending applications:

1. Continuous operation dry processing (British Patent Application No. 9805927.2). The gas generator can be used to

supply a process gas to etch substrates placed in the process chamber. This may involve the use of a plasma to generate the reactive species or without a plasma where the generated gas reacts spontaneously with the substrate.

2. Alternative gas for the switched plasma process (EP-A-0822584 and EP-A-0822582). The addition of the generated gas allows the replacement or addition to the existing process etch gas used in the switched plasma process. The generated gas e.g. fluorine or nitrogen trifluoride can be advantageously used to enhance the process etch rate either individually or in combination with the existing sulphur hexafluoride.

3. Alternative gas for the plasma-less switched process (British Patent Applications Nos. 9815931.2 and 9823364.6). Where the generated gas spontaneously reacts with the substrate, substitution of the sulphur hexafluoride process gas will also allow the operation of the process without plasma in the process chamber.

In addition, it is envisaged that the invention can be used in the generation of gases for a plasma/plasma-less switched process similar to that in British Patent Application Nos. 9815931.2 and 9823364.6. The ability to generate gases or combine gas mixtures which either require a plasma to produce the reactive species or spontaneously react with the substrate, allows the capability to introduce a process schedule which may only require a plasma for one or other of the process steps in the overall process schedule.

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Wynne - Jones Laine + James

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